

- 42 -

WHAT IS CLAIMED IS:

1. A multimode/multiband mobile station for wireless networks operating based on various wireless interface standards, the mobile station comprising:
 - 5 a plurality of low-noise amplifiers (LNAs), each matched to a selected frequency band; and
 - a near-zero intermediate frequency (NZIF) broadband image rejection (IR) mixer for receiving an amplified radio frequency (RF) signal from one amplifier selected among the plurality of LNAs and generating a first analog intermediate frequency (IF) signal by down converting the amplified RF signal.
- 10 2. The mobile station of claim 1, further comprising a switch for coupling the selected LNA with the NZIF broadband IR mixer.
- 15 3. The mobile station of claim 2, wherein the switch selects the selected LNA according to a first wireless interface standard by which the mobile station operates.
- 20 4. The mobile station of claims 3, further comprising a programmable frequency controlled oscillator for supplying an oscillator reference signal of a selectable frequency to the NZIF broadband IR mixer.
- 25 5. The mobile station of claim 4, further comprising a first reconfigurable band pass filter (BPF) for filtering the first analog IF signal output from the NZIF broadband IR mixer.
- 30 6. The mobile station of claim 5, wherein the first reconfigurable BPF filters the first analog IF signal according to the first wireless interface standard by which the mobile station operates.
7. The mobile station of claim 6, wherein the first reconfigurable BPF removes useless frequencies from the first analog IF signal.

- 43 -

8. The mobile station of claims 7, further comprising a programmable variable gain amplifier (VGA) for amplifying a first filtered analog IF signal output from the first reconfigurable BPF.

5 9. The mobile station of claim 8, further comprising a second reconfigurable BPF for filtering the a first filtered analog IF signal amplified by the programmable VGA.

10 10. The mobile station of claim 9, wherein the second reconfigurable BPF is an anti-alias filter.

11. The mobile station of claim 10, further comprising an analog/digital converter (ADC) for converting a second filtered IF signal output from the second reconfigurable BPF to a digital IF signal.

15 12. The mobile station of claim 11, wherein the programmable VGA amplifies the first filtered analog IF signal based on an operating range of the ADC.

20 13. The mobile station of claims 12, further comprising a reconfigurable digital IF processing block.

25 14. An operating method of a multimode/multiband mobile station for wireless networks operating based on various wireless interface standards, the method comprising the steps of:

amplifying a receive radio frequency (RF) signal by selecting one of a plurality of low-noise amplifiers (LNAs), and matching each of the plurality of LNAs to a selected frequency band; and

30 generating, by a near-zero intermediate frequency (NZIF) broadband image rejection (IR) mixer, a first analog intermediate frequency (IF) signal by down converting the RF signal amplified by the selected LNA.

15. The method of claim 14, further comprising the step of coupling

- 44 -

the selected LNA with the NZIF broadband IR mixer using a switch.

16. The method of claim 15, wherein the switch selects the selected LNA according to a first wireless interface standard by which the multimode/multiband mobile station operates.

17. The method of claims 16, wherein the NZIF broadband IR mixer receives an oscillator reference signal of a selectable frequency from a programmable frequency controlled oscillator.

10 18. The method of claim 17, further comprising the step of filtering the first analog IF signal output from the NZIF broadband IR mixer in a first reconfigurable band pass filter (BPF).

15 19. The method of claim 18, wherein the first reconfigurable BPF filters the first analog IF signal according to the first wireless interface standard by which the multimode/multiband mobile station operates.

20 20. The method of claim 19, wherein the first reconfigurable BPF removes useless frequencies from the first analog IF signal.

21. A multimode/multiband mobile station comprising:
a transmission module for transmitting multimode/multiband signals through transmitters; and

25 a reception module for receiving signals corresponding to the same frequency bands among the multiple modes and multiple bands through combined receivers, which receive at least one radio signal of the same frequency band for different services together, and receiving signals not corresponding to the same frequency bands through receivers for different frequency bands.

30 22. The mobile station of claim 21, wherein each of the combined receivers comprises a low noise amplifier (LNA) amplifying a reception signal of the same frequency band for difference services.

- 45 -

23. The mobile station of claim 21, further comprising a duplex module for dividing transmission/reception signals of a frequency division duplex (FDD) technique and a time division duplex (TDD) technique.

5 24. The mobile station of claims 21, further comprising a duplex for receiving a GSM signal and transmitting the received GSM signal to a GSM receiver.

10 25. The mobile station of claim 21, wherein the duplex further comprising a duplex for receiving one of a GSM signal or WCDMA signal of a common band and transmitting the received signal to a WCDMS/GSM combined receiver.

15 26. The mobile station of claim 21, wherein the multiple modes and multiple bands comprise a WCDMA2000MHz band, a WCDMA1900MHz band, a WCDMA850MHz band, a GSM850MHz band, a GSM900MHz band, a DCS1800MHz band and a PCS1900MHz band.

20 27. The mobile station of claim 21, wherein the transmission module comprise at least one of a WCDMA2000MHz transmitter for transmitting a signal of the WCDMA2000MHz band, a WCDMA1900MHz transmitter for transmitting a signal of the WCDMA1900MHz band, a WCDMA850MHz transmitter for transmitting a signal of the WCDMA850MHz band, a DCS1800/PCS1900 transmitter for transmitting signals of the DCS1800MHz and PCS1900MHz bands, and a GSM850/GSM900 transmitter for transmitting signals of the GSM850MHz and GSM900MHz bands.

30 28. The mobile station of claims 21, wherein the receivers for different frequency bands comprise at least one of a WCDMA2000MHz receiver for receiving a signal of the WCDMA2000MHz band, a DCS1800 receiver for receiving a signal of the DCS1800MHz band, and a GSM900 receiver for receiving a signal of the GSM900MHz band.

- 46 -

29. The mobile station of claim 21, wherein each of the combined receivers comprises one of a WCDMA/PCS1900 receiver for receiving a signal of the WCDMA1900MHz band and a signal of the PCS1900MHz band together and a WCDMA/GSM850 receiver for receiving a signal of the WCDMA850MHz band and a signal of the GSM850MHz band together.

5

30. The mobile station of claim 21, further comprising:

a first mixer for converting a signal of a high frequency band received by receivers receiving a main reception band, which is a band with a high usage rate in a certain area, among the multiple modes and multiple bands to a signal of a low frequency band; and

10 a second mixer for converting a signal of a high frequency band received by receivers receiving a sub reception band, which has a low usage rate in a certain area, among the multiple modes and multiple bands for multiple communication services to a signal of a low frequency band.

15

31. The mobile station of claim 30, wherein the sub reception band comprises a diversity band.

20

32. A multimode/multiband mobile station comprising:

a switch module for performing a switching operation for selecting a mode and band to be received among multiple modes and multiple bands based on a predetermined control;

25

receivers, each for receiving its own mode/band signal among multimode/multiband signals based on the switching operation;

mixers, each for down converting the received signal using a local frequency corresponding to the mode and band to be received;

30

a baseband processing module for controlling a receiver corresponding to the mode and band to be received among the receivers based on a predetermined control, baseband-processing the down converted reception signal, and outputting a baseband signal by classifying the baseband signal for each mode; and

a modem module for outputting a control signal for receiving a signal of the mode and band to be received, controlling the local frequency to a local

- 47 -

frequency corresponding to the mode and band to be received, and demodulating the baseband signal for each mode through a modem for each mode.

33. The mobile station of claim 32, wherein the multiple modes and
5 multiple bands comprise bands of a WCDMA mode and bands of a GSM mode.

34. The mobile station of claim 32, wherein the receivers comprise:
10 WCDMA receivers for receiving bands of the WCDMA mode;
GSM receivers for receiving bands of the GSM mode; and
WCDMA/GSM combined receivers for receiving common bands of the
WCDMA and GSM modes.

35. The mobile station of claim 33, wherein the switch module
comprises:
15 a first antenna switch for performing switching for selecting a reception
mode and frequency band to be received among the bands of the WCDMA mode
and the bands of the GSM mode based on a predetermined control;
a band selection switch for selecting a frequency band of the GSM mode
when the reception mode is selected as the GSM mode; and
20 a second antenna switch for selecting whether WCDMA diversity
reception is performed when the reception mode is selected as the WCDMA mode.

36. The mobile station of claims 33, wherein the mixers comprise:
25 a first mixer for down converting a signal received by receivers receiving
the bands of the WCDMA mode and the common bands of the WCDMA and
GSM modes among the multiple modes and multiple bands; and
a second mixer for down converting a signal received by receivers
receiving the bands of the GSM mode and WCDMA diversity bands among the
multiple modes and multiple bands

30 37. The mobile station of claim 36, wherein the baseband processing
module comprises:
a first baseband processing unit for baseband-processing each band signal

- 48 -

of the WCDMA mode and each band signal of the WCDMA and GSM modes down-converted by the first mixer based on a predetermined control;

a second baseband processing unit for baseband-processing each band signal of the GSM mode and each WCDMA diversity band signal down-converted by the second mixer based on a predetermined control; and
5

a controller for controlling processing operations of the first and second baseband processing units according to a reception mode and band characteristic.

38. The mobile station of claim 37, further comprising:

10 a first path for transferring a WCDMA signal among baseband signals output from the first and second baseband processing units to the modem module; and

15 a second path for transferring a GSM signal or a WCDMA diversity signal among the baseband signals output from the first and second baseband processing units to the modem module.

39. The mobile station of claims 37, wherein the modem module comprises:

20 a WCDMA modem for demodulating the WCDMA baseband signal output from the baseband processing module;

a GSM modem for demodulating the GSM baseband signal output from the baseband processing module;

a WCDMA diversity modem for demodulating the WCDMA diversity baseband signal output from the baseband processing module; and

25 a modem controller for outputting a control signal to receive a signal of a desired mode and band among the multiple modes and multiple bands and controlling the local frequency to a local frequency corresponding to the mode and band to be received.

30 40. The mobile station of claim 39, wherein the control signal to receive a signal of a desired mode and band among the multiple modes and multiple bands comprises:

a switch control signal for controlling the switch module; and

- 49 -

an SPI signal for controlling the baseband processing module.

41. The mobile station of claim 40, wherein baseband processing module controls an operation of a receiver corresponding to a mode and band to be received among the receivers based on the SPI signal, controls a low noise amplification (LNA) gain of a WCDMA/GSM combined receiver to an LNA gain corresponding to the mode and band to be received when the receiver corresponding to the mode and band to be received is for a WCDMA/GSM combined band, and controls processing operations of the first and second baseband processing units.

42. The mobile station of claim 39, wherein the switch control signal for controlling the switch module comprises:

a first switch control signal for selecting a reception mode and frequency band to be received among the bands of the WCDMA mode and the bands of the GSM mode;

a second switch control signal for selecting a frequency band of the GSM mode when the reception mode is selected as the GSM mode; and

a third switch control signal for selecting whether the WCDMA diversity reception is performed.